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CONTRIBUTIONS TO WESTERN BOTANY. No. 5.

BY MARCUS E. JONES.

REVISION OF THE AMERICAN SPECIES OF AQUILEGIA NORTH OF MEXICO.

In studying the species of this genus a person is struck with the amount of labor wasted in describing them, and the uncertainty attaching to the species recognized. This is due largely to the multitude of characters belonging to the genus that are not given in any book and which most people do not know are generic. The really specific characters are few. There are two distinct lines of species in the genus so far as our western ones are concerned, which hybridize among themselves and possibly with each other. One line has petal-limb dilated above and flowers never truly red; the other has petal-limb not dilated above and red or reddish flowers. The following gives my views of this genus, though I am inclined to think that further research may prove that *A. flavescens* will become a variety of *cærulea*, *A. formosa* a variety of *A. Canadensis*, while the margin between *cærulea* and *chrysantha* is very slight.

AQUILEGIA L. COLUMBINE.

Parts of flowers in fives (except stamens) petal-like, alternate, stamens many. *Sepals* narrowed at base into a short claw and bent at base, usually acute, equaling the limb of petal or longer, widely spreading or reflexed, rather veiny, often green-tipped and simulating a gland. *Petals* either saccate at insertion or prolonged backward into hollow, usually tapering spurs which are short to four inches long and with a nectary in the tip set obliquely on the spur; limb of petals either almost obsolete or nearly equaling the sepals, usually rather thick, erect, and yellow, or sometimes white at least at the tip. *Stamens*

separate, many, an inch or less long, erect except in the first stages; anthers yellow, elliptical to oval, and usually obtuse at both ends, basifixed, one-half a line or less long, wider after bursting, filaments yellow and filiform at apex, white and enlarged and scale-like at base; next the ovaries is a sheath of sterile filaments which are enlarged throughout, nearly equaling the others, lanceolate, ridged, corrugated and white. *Ovaries* five, erect, closely aggregated, linear-cylindric, densely white-pubescent with glandular hairs up to the glabrous, filiform, persistent styles (two to four lines long) which with the ovaries are a trifle shorter than the stamens in flower, but the rapid development of the ovaries soon thrusts out the styles; stigma very small and capitate. At maturity the carpels lengthen to about an inch (half an inch in one case) and are linear, straight, but bent outwards at tip, cross section obovate, opening along the inner side from the oblique tip down, sparsely glandular-hairy, reticulated; seeds many, in a single row, horizontal, obliquely obovate cylindric, a line long, rounded on the back, with sharp inner edge, very black, smooth and shining when fully ripe, but less mature ones are brown. *Flowers* paniculate, racemose, or in one species single, the main stem sending off, usually above the middle, three to five branches remotely, each branch being subtended by a single leaf, branches a foot or less long, and lower half naked while the upper half has one to three flowers or rarely is again branched with one to three flowers on each branch, flowers terminal and centrifugal (central one blooming first). *Peduncles* usually with leafy bracts at base, and central one often with two in the middle, peduncles one to four inches long, more or less bent, but erect in fruit, longer than the flowers, glandular hairy. *Roots* perennial, fusiform, thick, with many short stout spreading branches at the top which are covered and much thickened with closely imbricated and old leaf sheaths. *Stems* tufted, erect, bent at base, tall (except in two species), usually leafless below, especially the lower third. *Leaves* with short, ridged sheaths one-fourth to an inch long; root leaves biternate (triternate in one species and with petiole absent in another), many, petioles long, generally about one-third the length of the stems; primary divisions of petiole two to four

inches long, secondary ones an inch long, or even all but the central one absent; leaflets irregularly two to three-lobed and the lobes entire to three to five lobed or toothed, and teeth rounded and blunt, leaflets obovate, cuneate, or broader, one-half to two inches long, seldom pubescent, glaucous or paler below; lower stem leaves similar with shorter petiole; upper stem leaves without a petiole; uppermost leaves reduced to simple or three to five-lobed usually leafy bracts which are usually acute; the development of the stem leaves depends upon the exposure inversely. The whole plant except the leaflets is covered with a glandular hairy pubescence which is scarcely visible at times and at others is very pronounced, but is of no specific value. It is most pronounced on the peduncles and young pods, and is more evident above. The genus frequents open woods in the East, and stream banks and moist mountain sides at rather high elevations in the West.

* *Limb of petal somewhat dilated above, oblong to rhomboidal, large, at least half as long as the sepals, and about equaling the stamens, flowers not red. Petals rounded, truncate or emarginate.* § *Dilatæ.*

\+ *Stems tall, often three feet high, nearly glabrous below; sepals acute, spreading, rather thin, nectary small.*

\+\+ *Spurs long, straight, slender, two to four inches long, not shorter than sepals, nectary very small, apparently abortive; flowers large, one and one-half to four inches wide, ascending; limb of petal four to six lines wide, six to ten long or even more.*

A. cærulea, James. Sepals white or lavender, lanceolate to broadly ovate, one to two inches long, occasionally tinged with pink or yellow; flowers two to four inches wide, petal-limb six to eight lines long, white to deep cream yellow, sepals and petals both frequently veined with blue, fragrant.

Abundant in Colorado at middle elevations 7000 to 11,000 feet altitude in all the mountains, mostly on moist mountain sides; very abundant in the Wasatch and Uintas at 8000 to 10,000 feet altitude and therefore subalpine, also in the Pine Valley Mountains in southern Utah; less abundant south and

west in the other ranges, also Mt. Ibapah in the Deep Creek Mountains, Jeff Davis Peak and the Schell Creek Mountains in eastern Nevada at high elevations, and probably in the East Humboldt Mountains; rare in Nevada and the Sierras of California, also northward to the Arctic regions. Much esteemed in cultivation where it is bluer.

A. chrysantha, Gray. *A. leptocera* var. *flava* Gray Pl. Wright 2, 9. *A. chrysantha*, Gray Proc. A. A. S., 8, 621. Flowers golden yellow throughout, one to two inches wide, spurs much longer than the sepals and very slender; sepals lanceolate, less than an inch long; petals as above.

Lower elevations 6000 to 8000 feet altitude in Colorado, and higher altitudes southward to 10,500 feet in Arizona. Rocky Mountains of Colorado from Colorado Springs south through New Mexico and Arizona. Not yet known in Utah. This appears to hybridize with *cærulea*, the flowers being yellow or tinged with blue and spurs shorter. Should it become necessary to recognize the varietal name, this will become *A. flava* (Gray).

A. longissima, Gray. Flowers yellow, spurs filiform, four inches long, and of about the same width throughout, petals nearly equaling the lanceolate sepals, elongated-spatulate. May be a form of the above.

Northern Mexico, *Palmer*.

++++ *Spurs short and thick, six lines long or less, somewhat hooked at the end, not longer than the small sepals, nectary large, flowers small, not even an inch wide and often very small, nodding or ascending, yellow, but often tinged with red or blue.*

A. flavescens, Watson King's Rep. 5, 10. Sepals lanceolate to oval, six to eight lines long; petal-limb somewhat dilated, about equaling the spur and nearly as long as the stamens, four lines wide, anthers elliptical-oblong, when the flowers are very small all the parts are small in proportion, except the stamens, which remain the same. All but the leaves often pubescent.

Six thousand to nine thousand feet altitude along streams in very wet, exposed, and boggy places, rarely at high elevations, most abundant at low elevations, cañons of the Wasatch from

central Utah northward to British America. It also occurs in the Uinta Mountains, but does not seem to exist in Nevada or westward. June to August. At high elevations it hybridizes with *A. cærulea*, the flowers being intermediate in size with shorter and stouter spurs than *cærulea*, whitish or tinged with blue.

\+ + *Stems very short or none; flowers blue, small, one-half inch wide or less, spurs somewhat hooked, two lines or less long, shorter than the limb of the petal.*

A. brevistyla, Hooker. Flora Bor. Am. 1, 24. Stems six inches high or less, densely tufted, not surpassing the leaves, stem leaves petioled and scarcely differing from the others, pedicels two to three inches long, very slender; sepals oval and very obtuse and green to lanceolate, acute, and colored, four lines long, three lines wide; limb of petal oblong, yellow, a little shorter than the sepals and a little longer than the stamens; carpels about an inch long, and styles in fruit two lines long, anthers narrowly oval and very small.

High Alpine regions in meadows, Colorado and northward to the Arctic regions. Not seen in Utah or westward.

A. Jonesii, Parry Am. Nat. 8, 211. Named for Captain Jones. Monocephalous, peduncle two to three inches long; leaves all crowded and common petiole absent or nearly so; leaflets small, obovate, entire, nine; spur almost obsolete. Probably a form of the above.

Summit of Phlox Mountain, Wyoming.

* * *Limb of petal not dilated above, usually with a very short, triangular tip or narrower, styles four lines long, flowers red, rarely yellow, at least the tip of the limb of the petal yellow or white, acute to nearly truncate, sepals acute, stamens usually much surpassing the petals, spurs rather stout, generally somewhat hooked, nectary large, flowers nodding, one to one and one-half inches wide, tall plants.* § *Rubescentes*

A. Canadensis L. Spurs one-half to twice longer than sepals, three-fourths to one inch long; sepals ovate one-half inch long; petal limb oblong to nearly square, four lines long, two to three

lines wide, nearly truncate; anthers elliptical, one-half line long. Upper leaves scarcely bract-like.

Open woods in the Eastern States. Seems to occur from Arizona to British America, in the Rocky Mountains rarely, at 8000 feet altitude or higher, but all these forms may be the next if it is distinct which is doubtful. Also in the San Francisco Mountains, Arizona Jones. May hybridize with *cærulea*.

A. formosa. Fischer, DC. Prod., 1, 50. Stout spurs about equaling the ovate sepals, five lines long, reflexed or widely spreading; petal limb three lines long, as long as broad, narrower at apex; stamens an inch long; anthers narrowly oval. Probably a form of the above, though the spurs are shorter and the upper leaves are more bract-like.

Along streams near the bases of the mountains, in cañons, 6000 to 8000 feet altitude. Said to exist in Colorado, frequent in western Utah, Nevada, and northward to British America, also Oregon, not found in California.

A. formosa, var. *truncata* (Fischer & Meyer), *A. truncata*, F. & M. Ind. Sem. Petr. Supp. 8. Differing from the above only in the limb of the petal being reduced to a rudiment. Intermediate forms seem to occur.

Along mountain streams at middle elevations in California and northward. May hybridize with *A. cærulea*.

* * * *Spurless; leaves triternate, flowers white or pink. Peduncles very long.* § *Pseudaquilegia.*

Aquilegia ecalcarata, Eastwood, Zoe ii, 220, two feet high, very slender, stems inclined to be glaucous and whole plant minutely and sparsely glandular pubescent; leaflets distant and few, on capillary stalks, sharply cuneate at base, thin, an inch long, veiny; peduncles four to six inches long, very slender, erect; bracts lanceolate-ovate, three lines long, entire; flowers three-quarters of an inch wide, parts delicate, thin; sepals closely and parallel veined, lanceolate, acute, spreading; petals the same as sepals but more delicate, and barely saccate at base; stamens just equaling the petals; anther very small, narrowly oval; styles barely pubescent at base, longer than usual; ovaries minutely glandular pubescent when young, when mature almost

glabrous; pods one-half inch long, delicate. The peduncles are almost glabrous, and the stem leaves have the petiole reduced in my specimen to a sheath.

Damp alkaline soil under shaded cliffs in S. W. Colorado June to July. Found first by Mr. Alfred Wetherill then by Miss Eastwood.

NOTES ON TOWNSENDIA.

This genus has always been a trying one to me because the descriptions have not fitted the plants as they grow. It now becomes evident that the trouble has arisen from the undue emphasis which Dr. Gray gave to the pappus, this being of almost no value. The glochidiate hairs seem to hold but there is one species in which there seems to be a transition in that respect. Although several species are said to be annual I have never yet seen a specimen that I would swear was an annual; most of these seem to germinate in the fall and put out a few leaves, while those said to be winter annuals are doubtless biennials; most of those said to be biennials are at least three years old, while few of them endure over four years, except perhaps *T. Fendleri*. All are early bloomers, for the altitude in which they grow, except *T. Fendleri* and even that may begin to bloom early but continues till frost.

Taking the order of Gray, *T. eximia* and *T. grandiflora*, Nutt. have glabrous rays. An interesting form from Labron, Colo., August 30, 1873, by Greene, has heads smaller than those of *T. eximia* and is diffusely and intricately branched, rigid, only minutely pubescent, with the scales and habit of *T. eximia* and the pappus of *T. grandiflora*. This is in the Herbarium of the California Academy. It may be a hybrid.

T. Parryi, Eaton. There are some points omitted from the description of the type by Gray. The leaves are acute, one-half to one and one-half inches long of which the blade is one-half and the petiole is slender; heads ebracteate; peduncle thickened above; scales ovate to lanceolate, soft and thin, scarious except midrib, acute, closely imbricated with no evident ranks but the outer successively shorter, not acuminate; heads six lines high; rays one inch long. This has widely lacerate scales, and is evidently a short lived perennial. From the type in the Herbarium

of the California Academy. This simulates *T. grandiflora* very closely but a specimen collected by Tweedy in May at a place in Gallatin County, Montana, tends to connect it with *T. florifer*. The heads are larger, and stems two to three inches high, spreading, lax; leaves spatulate, obtuse, and like those of *T. scapigera*. It is separable from *T. florifer* only by the perennial root, and the scales. The pappus of disk and ray are equal, and the ray is glabrous.

Townsendia florifer, *scapigera*, and *Watsoni* are manifestly much confused. The first was originally described as a perennial and is certainly a biennial at least, the second was described as perennial and is manifestly such but blooms the second year, the third is not a good species unless it covers many things referred to the first and the second by Gray, while its real character, a winter annual seems to have been overlooked by Gray or confused with the others.

Townsendia florifer (Hook.) Gray, as I understand it, is confined to Oregon, Washington and northwestern Nevada. It is a little ashy, but the leaves are usually nearly glabrous, and thick as though succulent; involucral scales about one-half as many as in *T. Parryi*, and definitely separable from that species only by the scales, which are green and ashy and much less imbricated; stems spreading, two to four inches long; leaves spatulate to linear-spatulate, shortly apiculate, the blade as long as petiole; heads one-half inch high and three-fourths inch wide; pappus equal in all the specimens I have seen. This is drawn from specimens in the California Academy from Washington, *Brandegee, Howell;* Virginia City, Nevada, *Brandegee.* Another form from Walla Walla by Mr. Brandegee has linear-spatulate leaves, acute, one to two inches long, and solitary heads on stout, leafy peduncles, which are ascending, and four to five inches long, rarely branched in the middle; whole plant ashy strigose to the scales; heads one-half inch high and very many. All the above forms are biennials. The rays are rough with yellow sessile glands on the outside. The plants seem to be confined to the valleys at low elevations, but may ascend the lower slopes of the mountains.

Townsendia scapigera, Eaton, so far as I know it, is rare. If all the plants which have been referred to it belong with it, the range is at least from southern Utah and northward to Idaho and westward to California, in the mountains at low elevations; *i. e.*, not alpine. Taking the type as given by Eaton in Bot. 40th, Parallel 5, 145, Fig. 17, my material from McIntyre's ranch, Utah, May 18, 1891, at 7000 feet altitude, corresponds with Eaton's type exactly, except that the plant is densely matted (surely perennial); leaves very narrowly linear, a little widened at apex, heads many and sessile, one-half inch high, three-quarter inch wide. Other characters not given by Eaton are that the rays are a line wide; lead-purple in the centre and with white margins, half an inch long, pubescent with white, rarely yellow, atomiferous gland-like bodies on the outside, rather firm in texture; leaves strigose and rough, thickish.

My material from Deep Creek, Utah, June 6, 1891, altitude 5500 feet, is the same as the above, except that the rays are only three lines long, and the leaves are spatulate and hoary strigose; plant two years old. My material from Schellbourne, Nevada, July 13, 1891, at 8000 feet altitude, is certainly three years old, and the same as Eaton's type, but closely branched; inner scales linear oblong, mostly acute, hyaline margin narrow; peduncles barely surpassing the leaves; very minutely pubescent; rays pubescent as in the above. My material from Wells, Nevada, is certainly perennial in small mats, whole plant white and rough with stiff hairs; peduncles with several bracts; scales linear, simply acute, sparsely strigose, lacerate margins rather wide; otherwise as in the type. The first form given under this species would be at once taken for *T. sericea*, but it is not that plant.

Other forms that may eventually prove to be *T. scapigera* I have given the provisional name of *T. montana*. To all appearances they make at least one good species. The type is a specimen from Alta, Utah, collected above the Flagstaff mine at about 9500 feet altitude, and therefore subalpine or alpine growing on rocky mountain sides. Loosely matted from a root at least three years old; leaves one and one-half inches long, blade oblanceolate and half the whole, nearly glabrous, but petioles rough with short hairs and under the microscope the blades are sparsely

pubescent, leaves fascicled at the top of the short branches of the root; heads one-half inch high, almost sessile and surpassed by the leaves, peduncles not lengthening with age; scales narrowly oblong, the outer the narrower, rounded at apex, the hyaline and lacerate margin narrow, midrib green; scales in about five ranks and the outer very short, inner scales one and one-half lines wide and shorter than the pappus; rays three lines longer than the disk, purple, three-quarter line wide; pappus alike and akenes glabrous; rays glabrous or nearly so. Another specimen which I refer to this I collected above Silver Lake in American Fork Cañon, Utah, July 30, 1880, at about 10,000 feet altitude, which is the same as the above, except that it is at least four years old and more loosely branched and leaves only an inch long. The inner scales are acute with rather wide lacerate margins, outer scales short, scales in at least three series; heads sessile. The glabrous akenes and habitat would indicate a distinct species.

Townsendia Watsoni, Gray. If Dr. Gray has not confounded this with the true *T. florifer* then this is not a good species. In order to find out I had two plants which I knew grew from the same seed sent to Harvard, one of them came back labeled "*T. florifer*" and the other "*T. Watsoni.*" It is therefore evident that the varying pappus was considered a specific character by Dr. Gray and was used to separate the species, but it is of no value whatever in this group and is hardly of any value in the genus at large. From quite an amount of material from the northwest it seems likely that there may be some good characters left on which to separate the species, the chief one being that the true *T. florifer* is biennial or more, while our plant of Utah and most of Nevada is a winter annual, almost white with a rough strigose pubescence which is short or long, the scales are in about two ranks; rays very pubescent on the outside with flattened hairs with yellow gland-like tips. Our plants are never fleshy and the leaves are not thick. It is a more graceful plant, and grows in the valleys in very dry places and is an early bloomer, it soon dries up and blows away. It is the plant referred to by me in "Contributions No. 3" as being a diurnal with flowers opening between nine and ten o'clock A. M., and closing between five and six o'clock P. M. It is the only *Townsendia* of our

valleys and abounds in western Utah and eastern Nevada at elevations from 4300 to 5500 feet. If these distinctions given to uphold the species fail, then this species cannot be maintained.

Townsendia sericea Hooker. A form of this in the Herbarium of the California Academy collected by Greene in New Mexico, locality not given, has the scales of *T. Rothrockii* and the pappus and leaves of *T. Wilcoxiana*, tending to confirm a suspicion which I have long entertained that these two species are only sports of *T. sericea*, and are not valid. A form collected by Miss Eastwood at Mancos, southwestern Colorado, June, 1891, shows an approach to *T. incana*. The rays of *T. sericea* are glabrous.

Townsendia incana, Nutt. As I have already indicated *T. Arizonica* is a form of this species, being separable only by the pappus a worthless character. In looking over my material from Milford, Utah, 1880, and named by Gray himself, I find that the pappus of the ray is often one-half that of the disk and the heads are often short peduncled with all sorts of transitions between, the rays are glabrous except very minute atoms scattered over them. True *T. incana* usually grows in smaller mats in lower elevations and has the rays pubescent with flattened hairs which are tipped with yellow gland-like enlargements. It is very common in the Sonoran region of eastern Utah and southwestern Colorado, and blooms in May and June. An interesting form of this species is—

Townsendia incana Nutt. var. *ambigua*, n. var. This would suggest *T. grandiflora* in some things. Short-lived perennial but blooming the second year; leaves spatulate, acute, gradually narrowed into a long petiole one to one and one-half inches long; heads ebracteate, from sessile to peduncled, peduncle being sometimes three inches long, one-half inch high or more, one-half inch to an inch wide; bracts in two to three series, acute. In all the specimens which I have seen, the pappus is in the ray flowers less than one-third that of the disk flowers, of single scales that are very narrow and bristle-like; otherwise exactly as in the species, except that it is less branched than the type. Common with the type in the same region as the type. It blooms from the middle of April to June. Collected

by myself in several localities in 1891 and in the same region by Miss Eastwood in 1892.

Townsendia glabella, Gray. This plant seems to have been collected but very little. Miss Eastwood sends it from Mancos, Colorado, collected in June, 1892. Her plants are perennials in a dense cæspitose tuft; bases of leaves villous otherwise glabrous, leaves spatulate to oblanceolate, acute, blade one-half to three-quarters inch long, two to three lines wide equaling the petiole; heads four to five lines high, on a naked peduncle one-half to one and one-half inches long; scales in two series the outer ones a little shorter and four to six in number, the inner six to eight, all lanceolate, acute (not acuminate) greenish at tip and with narrow hyaline margins; rays purple and glabrous; outer pappus one-quarter the inner; root not slender.

Townsendia strigosa Nutt. The usual form of this plant is a very pretty winter annual with glabrous rays, but one form collected in Wyoming at Church Buttes, July, 1873, seems to be a short-lived perennial. It abounds in the higher Sonoran region of eastern Utah and adjoining Colorado, and is abundantly distinct from *T. Fendleri* or any other species which I know. It does not exist in the mountains which are the home of the allied *T. Fendleri*.

Townsendia Fendleri, Gray. As I understand this species it is a summer bloomer continuing till frost, it seems to begin at a little below 6000 feet altitude and continues to at least 8000 feet. It is confined apparently to the mountains of south central Colorado and New Mexico, being found as far west as Glenwood Springs (Miss Eastwood). The stems are tall strigose and rough and usually decidedly perennial, though it blooms the second year. It is at once recognized by the narrow leaves, very rough pubescence, and much branched habit. The rays are glabrous.

NOTES AND NEW SPECIES.

Thelypodium elegans, n. sp. Biennial, two to five feet high, erect, slender, simple, or branched at the base often; glabrous except racemes and stems, at least the lower ones and rarely the young pods sparsely pubescent with long tangled wool; lowest

leaves oblanceolate, contracted into a broad margined petiole, usually finely denticulate but sometimes coarsely dentate, obtuse, lower stem leaves oblong-lanceolate and denticulate at apex, auricled, upper stem leaves lanceolate and the uppermost ovate, acute, broadly auricled, reduced; racemes one to two feet long, close, wand-like; pedicels five to eight lines long, ascending, rarely horizontal in fruit, slender in flower; sepals narrow, two to three lines long, obtuse; petals white or tinged with purple, four to five lines long, oblanceolate to oblong-obovate; anthers curved and always partly or wholly exserted; flowers usually one-half as long as pedicels; pods one-half a line wide, three inches long, generally spreading at an angle of 45°, occasionally bent in an arc downwards, but no specimens with pods all arched, pedicels never reflexed; stipe a mere rudiment; beak one to three lines long. This is a close congener to *T. ambiguum*, but pods stipeless, beaked, lower stems always pubescent, flowers much smaller and nearly white, and pedicels longer. A form from Green River Utah. that I refer to this species is simple stemmed and with appressed pods.

Westwater, Colorado, May 7, 1891, also adjoining Utah. Common on the adobe plains of the desert.

Caulanthus crassicaulis, Watson var. *glaber*, n. var. glabrous throughout. Otherwise exactly as in the species. Type from Summit near Sink Valley, S. Utah at 7000 feet altitude June 23, 1890. During the present year I have seen this occasionally in eastern Nevada along with the species. It is quite striking but passes into the type.

Lepidium montanum, Nutt. var. *alyssoides* (Gray Pl. Fend. 10). It is so manifest that this is only a more enduring form of *L. montanum* that it is useless to keep it up as a species longer. It passes by insensible gradations into the type.

Lepidium Utahense, Jones in Herb. This is the plant which Watson wrongly referred to *L. montanum* as a form of his var. *heterophyllum*. It was first published by me in my lists of the Flora of Utah collected in 1880 and published early in 1881 but without a description. In the thirteen years which have elapsed since, I have never seen anything to change my original opinion,

though at the time I deferred to his opinion. The plants were collected at Milford, Utah, June 23, 1880, at 5000 feet altitude, in alkaline meadows, being just in flower. Perennial from a deep, large, fleshy, erect root which is often divided at the apex into many dense crowns, the crowns are covered with many stiff dead leaf petioles and with some rosulate new leaves which are two to three inches long with margined petioles a little shorter than the narrowly elliptical blade which is entire, fleshy, barely acute at apex and cuneate narrowed at base; stems erect or the outer ones ascending, twelve inches or less long, simple, purplish at base, glabrous throughout even to the pods except a very minute pubescence on the upper stem which is denser on the pedicels and sparse on the sepals and long; stem leaves one to two inches long, fleshy, entire, barely acute, broadly linear, a little contracted at base but hardly petioled, not at all clasping nor auricled, one-half longer than the internodes, many, scarcely shorter above; spikes short, one to two inches long, sessile or nearly so in fruit, a mere head in flower; pedicels rather stout, short in flower, in fruit ascending but tips usually horizontal, three lines long, round, but with a ridge on either side and so seeming flattened, a little thickened at apex; sepals green, oval, very concave, rounded and hyaline at apex, three-quarter line long, often sparsely long-hairy; petals obovate one and one-half lines long, white; stamens apparently two with large oval anthers half as long as the stout filament, just equaling the short stout style; pods two lines long and a line wide, seeming acute at each end but minutely notched at apex, flat, not winged, elliptical, not corrugated, the two nerves very prominent and raised into a very narrow wing in the middle of the pod, of the same width as the style and seeming to be a prolongation of it; style one-third line long and much longer than the minute notch; pods erect and so at right angles to the apex of the pedicel. Distributed as No. 1821 of my Utah sets.

Astragalus pephragmenus, n. sp. Nearest to *A. glareosus;* referred to *A. Shortianus*, var. *minor* Gray. Perennial, matted from a much branched woody root, stems one to four inches long, spreading on the ground; stipules large and scarious, triangular, very slightly connate below, adnate to the petiole; whole plant

even to the pod shortly villous tomentose; leaves about four inches long, the petiole being one-third of it; leaflets eight to fifteen pairs, oval to elliptical, four lines long, greener above; peduncles including the rachis of the short spike equaling the leaves, stout, sulcate, ascending; bracts three lines long, ovate, scarious; flowers nearly sessile, six lines long, light purple, six to ten in a close raceme or short spike; calyx woolly, four lines long, teeth one-third the tube, subulate; keel two lines longer than the calyx and teeth, barely acute, incurved to one-third circle, purple tipped; wings about the same length as keel; pod an inch long, oblong, nearly straight, base rounded and jointed to a very short stout stipe one-third a line long, apex prow-like and abruptly acute (like *A. Preusii*), dorsal suture very slightly impressed, very narrow externally, ventral suture very thick externally, not impressed but pod often slightly bisulcate ventrally, suture one-half a line thick externally and widest in the middle of the pod; pod one-celled, three lines wide, very thick walled (one-twentieth inch thick in the dried specimen), inner wall dense, outer spongy; pod wrinkled longitudinally and obscurely so transversely; pubescence of pod minute but rather close and tomentose; hairs of the plant very slender, attached by the base and nearly smooth. This plant at once suggests *A. glareosus*, *Missouriensis*, and *Shortianus*, but differs from them all in apparently good characters. I doubt if any connecting forms have ever been known that would place this as a form of *A. Shortianus*.

This was gathered on the summit of the Pinal Mountains, Arizona, May 26, 1890 in rocky places. I have been inclined to place it as a form of *A. Chamæleuce* and the latter plant I think is the same as *A. glareosus* the older species, but I now regard it as a good species. It is in my sets recently distributed.

Astragalus Purshii Douglas. The very imperfect description of this plant given in Flora N. A. T. & G. is manifestly the type as it exists in the great region which it covers, but there are two errors in the description, the flowers are not one and one-half inches long and they are not yellow. Others have followed the same error as to color of the flowers, being led astray by the color in the herbarium and by old flowers; the flowers are white

when fully developed and as they fade or become old they turn to a rich cream color. I have never yet seen a truly yellow flower even in a herbarium specimen. It is one of the earliest spring flowers, coming out along with *Cymopterus montanus*, and is out of bloom in a month or less. I will give a detailed account of field studies on this plant in a later issue.

Through the kindness of Miss Eastwood and Mrs. Brandegee I have been enabled to examine all the material of the *Eriocarpi* in the Herbarium of the California Academy. Of *A. Purshii* I have seen material from Wyoming, Washington, and the Sierras as far south as Tehachapi and Tejon Mountain, California.

Astragalus Purshii, Douglas var. *tinctus*, n. var. leaves very broadly obovate, small; flowers purple, otherwise as in the type.

Edgewood near Mt. Shasta and also in Ventura County, Cal., Brandegee; Olanche and Keeler, Inyo County, Cal., Brandegee; the former also by Miss Eastwood, Soda Springs, Nevada County, Cal., 1882 Jones, and an intermediate form June 16, 1882, Austin Nevada, Jones. This seems to belong to western Nevada and the Sierra Nevada region. It should be remembered that the type of *A. Purshii* is stemless.

Astragalus Purshii, Douglas var. *longilobus*, n. var. Calyx lobes filiform nearly equaling the keel; peduncles as long as the leaves; otherwise as in the type. Tehachapi, June, 1884, Brandegee; Aurum, Nevada, May 4, 1893, Jones (not in fruit). Also Tanesville, Cal., June 30, 1892, Brandegee. This has very long stipules and pod of *A. inflexus*, but the woolliness of *A. Purshii*. Connecting forms occur, but as yet I have seen no specimens which I could not at once separate from *A. inflexus*.

Astragalus inflexus Douglas. A plant in the Herbarium of the California Academy by Canby from Washington, 1883, has a stem six inches high, with six leaves or joints from a closely branched root; whole plant white with long and very fine hairs, having a floccose appearance, but the hairs are not much tangled; stems zigzag; proper petiole an inch or less long; stipules and bracts the same as in *A. Purshii*, but usually wider; six lines long, hyaline, tapering from base to a fine, threadlike point; leaflets ten to fifteen pairs, elliptical, six lines long, sharply apic-

ulate, at least the most of them, acute at base and a little cuneate; nodes of stem shorter than the leaves, which are three to four inches long; naked part of peduncle as long as the leaf, erect; flowers racemose, few; fruiting pedicels one to one and one-half lines long; calyx hyaline, not much inflated, cylindrical, tube five lines long, teeth nearly the same and almost filiform except at short triangular base; blade of keel two lines long, purple tipped, very long clawed; wings a little longer than keel, and banner a line longer than wings; flowers not large and probably white; pods ascending, short-stalked and jointed at tip of stalk, as in *A. Purshii*, the stalk being one-third to one-half a line long and stout, pods simply shaggy as in *A. malacus*, fleshy, finely wrinkled, usually bent into a half circle, three lines wide, one to one and one-half lines thick, much obcompressed till the sutures nearly meet, with a very broad, shallow sulcus above and below, point of pod sharp but scarcely flattened; seeds rather large, a line long; pods cartilaginous.

Two forms which I refer to *Astragalus Utahensis* T. & G. in the Herbarium of the California Academy are one from Candelaria, Nev., by Shockley, with flowers and peduncles of this species and the pubescence less woolly and stems not branched; and one by Brandegee from Pyramid Lake, Nevada, which is this species, but the pubescence is more that of *A. Purshii*.

*Astragalus leucolobus.** This is a specimen from Mr. Parish in my herbarium labeled "Watson"; if it has been published I do not know it. The plant is many-stemmed from a somewhat woody root and stems short, one to two inches long and decumbent; nodes shorter than the large, triangular, acute, hyaline, free stipules; peduncles four to five inches long, ascending, rather stout, three to five-flowered at the tip, and with flowers close together; bracts hyaline, broadly ovate to lanceolate, acutish, one to two lines long; pedicel almost none; flowers nearly horizontal, purple but lighter below; calyx cylindric, three lines long, one line wide, inclined to be narrowed at apex, base oblique; teeth very short, triangular, one-half a line long, erect;

* It is probable that *A. leucolobus* is a clerical error for *A. lectulus* Watson Proc. Amer. Acad. 22, 472, as the description there given accords with the plant under consideration.

keel gently bent at tip into an arc of a circle, blade two and one-half lines long, less than a line wide, obtuse; linear wings barely surpassing keel; banner a little longer than wings and ascending; flowers about three lines longer than calyx, and calyx scarcely deeper cleft above and but little inflated; pods immature, but apparently about the size of *A. Purshii*, but base nearly straight and apex hooked, thin, sulcate dorsally one-half a line deep, cross section probably obovate-cordate, apparently very shortly stipitate in the calyx, white with a dense, very short pubescence. The leaves are two to three inches long, of about ten leaflets, which are close set, three lines long, elliptical to oval, obtuse; petiole one to two inches long; whole plant hoary with close, fine, short hairs. This has the look of *A. Utahensis*, but with shorter and stouter flowers and longer peduncles. It may not belong at all to the *Eriocarpi*, but its true position cannot be made out without mature pods. Collected by S. B. Parish in Bear Valley on San Bernardino Mountain, Cal., June, 1892.

To this I refer a specimen collected by Miss Eastwood on Cantua Mountain, Cal., May 19, 1893. It either belongs here or is a new species. The nodes are a little longer, short stems much branched; leaflets two lines long, oval; pods shaggy with dense long hairs as in *A. Utahensis*, hooked at the end as in this species; whole plant shaggy and hoary; pods immature. Manifestly closely allied to *A. Utahensis*.

Astragalus lentiginosus, Douglas. To this species I have referred with some doubt a plant sent by Mr. Brandegee from Lone Pine, Cal., May 16, 1890. It has the long peduncle of the var. *Fremonti*. The calyx is oblique and like that of *Hedcoma Drummondi*, a line long with lobes as long and subulate, cleft deeper above, hoary with white appressed hairs, flowers and pods horizontal; keel abruptly incurved to more than 90°, a line shorter than the ascending, linear-oblong wings which are rounded at apex, light purple; banner light purple, a line longer than wings, nearly erect, large, sides reflexed; peduncles four inches long, longer than the leaves, ten to fifteen-flowered above the middle, racemose; pods congested, oval, abruptly short-pointed, three-quarters inch long, one-half inch wide, papery, glabrous, or very minutely pubescent when young;

lower leaves small, upper the largest, these are oval to obovate, obtuse; stems many, erect, leafy.

I can see no character to surely separate this species from *A. diphysus* Gray, and it is not at all certain that it is distinct from *A. Coulteri.*

Astragalus lentiginosus Douglas. A plant collected at Alcalde, Cal., 1890, by Mr. Brandegee would fall under the variety *Fremonti.* It is evidently perennial, one and one-half feet high, erect, whole plant tomentose-canescent, sparse above; calyx densely black-hairy, cylindric-campanulate, three lines long, a line wide, teeth one-third the tube; flowers ochroleucous, five lines long; peduncles a little surpassing the leaves, densely flowered; pods very shortly stipitate and jointed at tip of stipe, sparsely hairy; leaflets about ten pairs, obovate; no petiole above.

Astragalus latus (*A. diphysus* Gray var. *latus* Jones, Zoe iii, 287). It is manifest that this is a distinct species as I have had a chance to study it this season from the beginning of its development to the end. It forms a loose mat on the ground, which is from one to two feet in diameter, the stems are short and the leaves long, the peduncles only half as long as the leaves and so the flowers are hid among the leaves, calyx thickened at base and the lower side the longer but straight, hyaline, white, sprinkled with minute black hairs, four lines long, one and one-half lines wide and a line thick, not bent nor uneven in width, cleft deeper above, teeth unequal, subulate, about a line long, inclined to spread; banner usually with sides not reflexed, ovate, four to six lines wide in the middle, bent abruptly at tip of calyx teeth at an angle of 45°, six lines longer than calyx, deeply notched at tip, thin and not thickened at base, light pink-purple, occasionally the outline of the banner is oblong, triangular or even fiddle shaped by the varying position of the sides; sulcus conical, and very small at its apex the tip of the keel; white spot obovate, cut up by radiating purple veins, reaches within one and one-half lines of the tip; wings narrowly oblong oblanceolate to broadly oblanceolate, rounded at apex which is often considerably enlarged, minutely notched on the lower side near the apex, one and one-half lines longer than the keel and purple at apex and lighter below, ascending 45°, concave to keel and

spreading at tip; keel straight, with tip incurved a little more than 90°, obtuse, purple at tip, exceeding calyx teeth by two and one-half lines; pods mottled, colored, or plain, sessile, very acutely long or short-pointed with incurved tip, much inflated, broadly to narrowly ovate, inclined to be retuse at base, cross section round or a little wider laterally, sulcate ventrally nearly to the middle and the contiguous sides not adherent, sulcate dorsally to beyond the middle so that the sulci meet but there is no septum between even when young, though the parts adhere, with age they separate, the contiguous sides of the dorsal sulcus adhere when young forming a false septum so that the pod seems to be only slightly sulcate dorsally, but as the pod matures the sides separate and so it becomes didymous, apex of pod not two-celled; mature pods chartaceous to membranaceous, immature pods slightly pubescent within with wall one-fortieth inch thick. Neither peduncles, stems nor petioles perceptibly sulcate; stipules adnate, triangular, not small, ciliate and inclined to be lacerate on the edge, acute, lower not larger; flowers loosely short spicate; peduncles none to four inches long; flowers three to ten; pods prostrate as well as the flowers; whole plant very glabrous. This is a mountain plant coming down the cañons to 7500 feet altitude, grows on loose, gravelly places by the roadsides and is not abundant; it never grows in alkaline places. The pods are destitute of any internal sap at all times. It begins to bloom about May 1, and continues for a month; the pods are mature by the first of July.

By way of amplification of what I have said about the confusion in species of the *A. lentiginosus* and *curtipes* group (Zoe 4, 28) I append some notes on species kindly sent me by Mr. Brandegee.

Astragalus near to *oocarpus* San Thomas, Lower California, April 26, '93. Same as the following except more robust and tall; peduncles not longer than leaves, stout; stem coarsely sulcate; leaves six inches long; petiole none; leaflets about twenty pairs, an inch long; pods more acute; flowers white, four lines long, narrow, calyx the same; keel abruptly rounded, straight, nearly equaling the oblanceolate, scarcely ascending wings; banner erect, small, barely a line longer than the keel

and one-half a line longer than the wings; stipules green, rather stiff, reflexed, triangular, acute, two lines long.

Astragalus near to *Parishii*. Vallederos Creek, Lower Cal., May 4, 1893. Stems ascending, many from a perennial root, a foot high, nearly smooth; peduncles four to six inches long, longer than the leaves; flowers small, three lines long, yellowish, spicate at the tip of the peduncle, reflexed; calyx campanulate, tube a line long, teeth triangular, one-half a line long; pods an inch long and half as wide, broadly elliptical, sessile, spicate, horizontal, one-celled, chartaceous, much inflated, barely acute, dorsal suture much more convex than the ventral, ventral suture somewhat inflexed, sutures thin; seeds rather large, on short stalks, confined to the middle of the pod as in most of this group, several; stipules triangular, not reflexed, two lines long; pedicels less than a line long, about equaling the ovate bracts; petiole an inch or less long; leaflets oblong, about eleven pairs, obtuse at apex and acute at base. The pods are finely reticulated, glabrous or minutely pubescent when young.

Astragalus between *oocarpus* and *Parishii*. San Pedro Martir, Lower California, May 6, 1893. About the same as *A. Parishii*, but stipules almost hyaline and seldom reflexed; peduncles twice as long as the leaves, with yellow flowers above the middle; pod one and one-half inches long; keel arched, wings very much so. It is quite probable that one polymorphous species will cover most of this group.

Astragalus Hookerianus Gray. This neat little group represented by two supposed species can be described so far as known in two words, i. e., pods balloon-shaped. Mr. Brandegee's specimens from Susanville, Cal., June 30, 1892. Stems a foot high, decumbent at base only; very minutely pubescent; leaflets elliptical to linear one-third to an inch long, acutish, about seven pairs; leaves two to four inches long and proper petiole less than an inch long; peduncles four to six inches long; flowers racemose near the end of the slender peduncle, in fruit distant; pods two inches long, half as wide, papery, finely reticulated, more or less spotted, rounded at apex and tapering into a stipe, ascending or nearly erect, much inflated, sutures very small and not at all

intruded; seeds large, fully a line long and nearly round, on a stalk a line long, few, confined to the middle of the pod; calyx one and one-half lines long, campanulate, scarcely oblique at narrowed base; subulate teeth one-half shorter. The cross section of the pod is probably round.

Specimens collected by Mr. Lemmon in Sierra County have long underground stems and short ascending stalks, four inches high, decumbent; pods thicker, one-half as large, more attenuate, with the stipe only equaling the calyx; leaves ovate to elliptical, acute, with prominent midnerve and very hairy. This would seem to connect with *A. Whitneyi*. The pods of both these species are one-celled. The flowers are not found in these specimens, but are said to be white in the former and purple in *A. Whitneyi*.

Astragalus proriferus n. sp. San Pedro Martir, Lower California, May 5, 1893, Brandegee. Allied to *A. Hornii*. Shrubby at base, one to two feet high, stems ascending, whole plant hoary with very short woolly pubescence which is denser above; the flowers only are glabrous, not the calyx; leaves four inches long, with a petiole an inch or less long; leaflets about ten pairs, oblong-lanceolate and obtuse but apiculate, to obovate and obtuse and not apiculate, three to ten lines long and one to three wide, acute at base; stipules triangular, herbaceous, acute, two to three lines long, upper ones little reduced; peduncles stout, one-half as thick as stem, six inches long, erect, many flowered from below the middle, racemose in fruit and spicate in flower; flowers dark purple, but keel lighter, fading to ochroleucous; calyx broadly campanulate, tube a line long, oblique, cleft deeper above; pedicels almost obsolete shorter than the obscure ovate bract, teeth as long as the tube, subulate, erect; keel three lines long, bent abruptly to a right angle or more at tip, acute, arched a trifle; wings lanceolate and apparently notched at tip; banner rather large, nearly round, ascending 80° abruptly from a point beyond the calyx teeth, a line longer than wings and keel, emarginate; pods obliquely ovate to oval, six lines long, three to four wide, chartaceous, inflated, one-celled, neither suture in the least inflexed, dorsal suture not evident, ventral suture much thickened in the middle where only, it is

seed-bearing, sessile, rounded at base, early splitting the calyx, cross section apparently broadly obovate, tip with a very pronounced flat and sharp, triangular beak, two lines long; dorsal suture very convex, ventral slightly so; seed stalk one-half a line long. Flowers and pods horizontal or nearly so. The spike of flowers reminds one of those of *Oxytropis deflexa.*

Astragalus inversus, n. sp. Allied to *A. stenophyllus* and *collinus.* Susanville, California, July 1, 1892, Brandegee. Glabrous throughout. Stems flexuose two feet long, straggling upward, small, apparently simple, faintly angled, floriferous above the middle, nodes two to three inches apart; stipules, lower ones, rather small and united at base, the rest green and tapering to a long point and reflexed, four lines long, distinct; peduncles ten inches long, as stout as the stems, at least twice as long as the almost filiform petiole and leaflets; leaflets an inch long, distant, about three pairs, all jointed to the petiole; flowers loosely racemose on the upper half of the peduncle, six to ten, distant in fruit, ochroleucous; keel very gently arched at tip and blunt, narrow, rather long-clawed, six lines long, nearly equaling the narrow obtuse wings and small banner, the latter ascending only; calyx teeth very short-triangular, one-quarter the length of the campanulate tube which is one and one-half lines long and narrowed at base, not oblique, apparently equally toothed, dark and finely pubescent; pedicels a line or less long; bracts minute, ovate; flowers ascending, in fruit reflexed but not pendulous; pod long acuminate at each end, compressed, one and one-half inches long, two lines wide, linear, cross section elliptical or narrower, one-celled, sutures not prominent nor at all impressed, dorsal suture concave and ventral convex and so the pod seeming wrong side up; stipe not jointed, nearly an inch long about half as long as the pod; seeds nearly round, many. The pod is purple and streaked with white, cartilaginous.

Astragalus collinus Dougl. var. *Californicus* Gray. To this I refer with some hesitation a plant collected at Ager, Siskiyou County, California, July, 1887, by Brandegee. Glabrous, cartilaginous, reticulated pods two inches long, two lines wide, and stipe three-quarters of an inch long, cross section oval, seeds a line

long and oval; leaflets ovate to oblanceolate, six lines long; leaves three inches long and calyx softly pubescent and whole plant otherwise glabrous; peduncles six inches or more long, erect and as stout as the stems; calyx campanulate with tube two lines long, the short triangular teeth one-third as long as tube; flowers not seen; pedicels stout, a line long; bracts very small; many stemmed from a woody root, one and one-half feet high, but base of stem bent, branched below. This at first sight seems to be very distinct from *A. collinus* but I cannot refer it elsewhere.

Potentilla (*Ivesia*) *Kingii*, var. *incerta*, n. var. Densely white silky throughout; leaflets obovate or ovate, densely imbricated; leaves three inches long, more slender than the type. Otherwise as in the type. Alkaline soil in the middle of Steptoe Valley E. Nevada, 5700 feet altitude, July 13, 1891. I am not able to compare this with *Potentilla eremica*, Coville which from the description would seem to be the same, but this is manifestly only a variety of the type as it shades into it.

Cymopterus purpurascens (Gray) *C. montanus* var. *purpurascens* Gray Bot. Ives. I cannot think that this plant which is so common from one end of Utah to the other and covers so wide a range is a form of the Rocky Mountain species which so far is not known west of the mountains of Colorado.

Cypmoterus Fendleri Gray. This species belongs to my section *Coloptera* and to it should be referred *C. Parryi* (C. & R.), *C. decipiens* Jones. I was misled by Watson's unwarranted reference of one of my specimens to *C. Fendleri* or I should have recognized the true place of *C. Parryi* in the synonymy.

Frasera speciosa Douglas var. *scabra* n. var. Closely resembling the type except that the root leaves are six to eight inches long, one and one-half inch or less wide; whole plant ashy scabrous even to the petals; the leaves are very nervose (seven of the nerves being very prominent), thick; petals oblong, three-quarters inch long, very obtuse and rounded; glands as in the type but very coarse, three to four lines long, attached below the middle and running nearly to the base, oblanceolate, acute at base, coarsely fringed; scales at base of petals coarse; anthers

reflexed, two lines long; stigmas enlarged and club shaped. This seems to be a good species but in view of the great variability in this genus I refer it here. It is about the height of the type, but the leaves are half as large and the flowers twice to three times as large. Collected at Pine on the edge of the Mogollon Mesa northern Arizona, June 2, 1890. Characters common to the type species and this are the long pedicels, narrow and very acute calyx lobes, equaling the corolla; greenish-speckled petals, glands and scales; verticillate leaves; stamens nearly as long as the petals; glands attached below the middle. Gray says in the Synoptical Flora that the glands are attached above the middle, but it is not true.

Notes taken by me this year at Alta, Utah, August 17, 1893, on the type species are as follows: Petals oval, five lines long, three and one-half wide, a little cucullate by the folding of the tip of the petals which are very acute, petals concave; two glands on each petal three lines long and one-half a line wide, they run within two and one-half lines of the tip of the petal and one-half a line of the base, rounded at each end and protected by lacerate hair-like scales a line long; base of petals with stiff scales two lines long; anthers inverted, extrorse, sagittate; stigma spoon shaped, bent, single; stamens just surpassing the stigma, spreading after anthesis.

Emmenanthe foliosa n. sp. A close congener to *E. pusilla* and with the same habit, frequenting alkaline soil. Deep Creek, Utah, June 6, 1891, altitude 5000 feet. Minutely and rather densely pubescent and somewhat glandular; blade of leaves one-half inch long and one-third the slender petioles, irregularly laciniate dentate, lanceolate to oblong, obtuse apex rounded; leaves not fleshy, rosulate mostly; annual, much branched from the base, one to three inches high; flowers single in the forks and in loose racemes which equal the leaves and are floriferous from base of peduncle, three to five flowered; pedicels not longer than the calyx, slender; calyx a line long in flower and two lines in fruit, lobes linear and very little enlarged at apex; corolla barely lobed, yellow and almost equaling the calyx, and overtopping the oval or oval-oblong, rounded and obtuse capsule which has a very short style and is eight-seeded; seeds large,

deeply corrugated at right angles to the length and rather irregularly, no reticulations across the corrugations, or scarcely visible, seeds dark brown.

Compared with *E. pusilla* the flowers are a little larger, yellow, as long as capsule; seeds four times as large and corrugated and scarcely reticulated, while the other has seeds spirally corrugated, black, with pits almost exactly those of a honeycomb and seeds contracted at each end, the seeds of this species are narrower and less pointed; the pubescence is also different.

Phacelia pinetorum n. sp. Habit and general appearance of *P. micrantha,* as slender but less leafy, nearly erect, but rather widely branched, three to eight inches high, first pair of leaves ovate, long-petioled, entire, small, lower leaves simply pinnate with oblong lobes which are not widened at apex, lower petioles not margined or scarcely so and as long as the blade, uppermost leaves oblong-linear, six to twelve lines long, entire or tridentate at apex, sessile, scarcely enlarged at base; pedicels one to four times the calyx, occasionally minutely glandular, always hirsute-hispid as well as the calyx; the leaves are sparsely hirsute pubescent and not glandular; calyx lobes lanceolate or ovate, narrower at apex or acutish, equaling or twice as long as the short campanulate, white or blue corolla; appendages about one-third the distance from the base of filaments to base of lobes and in pairs; capsule globular; seeds few oblong or ovate to oval, very deeply favose, not transversely corrugated nor tuberculate; calyx enlarging.

Under pines in the Deep Creek Mountains at 8000 feet altitude, growing in situations similar to *Polemonium micranthum*, June 12, 1891.

Gilia pentstemonoides n. sp. Cæspitose from a much branched perennial root; leaves linear-oblanceolate, acute, two inches long, densely fascicled at the summit of the root branches gradually contracted into a slender petiole, entire, rather thick, glabrous; paniculate stems four inches high, but proper stem an inch long, with short racemes arising from the axils of the scarcely smaller stem-leaves which are three to five in number; upper

stem glandular-hairy; calyx tube equaling its subulate lobes, a line long, on a slender pedicel as long; corolla blue, salverform, tube three lines long, lobes ovate or oval, one and one-half lines long; stamens and style long exserted; capsule oval, two-thirds the length of the calyx. Collected at Cimarron, Colorado, on rocks, September, 1890.

Pentstemon confusus n. sp. Uniformly referred by Gray and Watson to *P. acuminatus*. About a foot high, glabrous, and inclined to be glaucous; flowers open, inclined to be horizontal; pedicels one to four lines long; calyx lobes very broad, acute, with hyaline margins; corolla three-quarters of an inch long, narrow and with large lobes, narrowest in the middle, gradually enlarged above, bilabiate, veiny, red, lobes in dried specimens blue with a purple sheen; uppermost leaves not auricled, somewhat clasping, seldom ovate; small sterile filament usually glabrous; otherwise as in *P. acuminatus*. This is the same as my No. 1819 in my Utah sets of 1880. This has always been confounded with *P. acuminatus* by Watson and Gray, and is probably the plant of the Great Basin referred to *P. acuminatus*, while the other is confined to the plains of Colorado and northward and may swing westward at the north into Montana. Also collected by me at Detroit, western Utah, May 26, 1891. It frequents dry sandy slopes in the foothills.

Pentstemon Moffatii, Eastwood. This is what I take to be the same plant as described by Miss Eastwood in Zoe and to which I have given a name in my still unpublished manuscript. Mr. Robinson refers it to *P. albidus* with which I do not agree. As I understand that plant it is confined to the region of the plains. I find that these plants are (in my specimens) pruinose pubescent throughout and with glandular hairy inflorescence; the root leaves are oblanceolate to ovate and with a cuneate base; petiole not longer than the leaves; lower stem leaves linear-oblong to oblanceolate, with or without a clasping base; the upper leaves are broadly ovate and with an acute or acuminate apex; flowers on very short pedicels, three-quarter inch long, purple, gradually ampliate, proper tube short; sepals large, ovate to lanceolate, acute; capsule ovate and acute, longer than the

sepals. The insertion of the two pairs of stamens unequally is, so far as my field studies go now, a generic and not a specific character of which I will write more at another time. Collected by me at Thompson's Springs, Utah, on the slopes of the clay hills on May 7, 1891.

Pentstemon deustus, var. *pedicellatus*, n. var. pedicels two to four lines long, rarely six lines long in the lower flowers; upper peduncles obsolete; all the filaments antheriferous; flowers dirty white and veined with purple; six to eighteen inches high, almost glabrous except the pubescent corolla. Among junipers and pinons at about 8000 feet altitude on gravelly slopes of mountains. July 3, 1891, at Muncy, Nevada, and also at Cherry Creek on the fourteenth of July. Local and rather common in such places.

Eriogonum rubiflorum n. sp. Near *E. reniforme* but leaves oval to orbicular, almost glabrous above, densely floccose tomentose beneath, not cordate, on petioles of equal or double length, blade six lines long; loosely pilose at the nodes, branched above, six inches high; pedicels and involucres glandular-hairy; pedicels four to six lines long, usually erect or spreading, but lower ones often reflexed (in rare cases all the pedicels are reflexed); involucres fully a line long, rather deeply lobed and lobes deep blood-red, hyaline-margined; flowers a line long, red with very deep red midvein which stops short of the rounded, emarginate tip; lobes oblong, glabrous. The prettiest of the *Ganysma* group. May 28, 1891, Dugway, Utah, on the open level places at 5000 feet altitude. It is also very common in eastern Nevada in similar situations.

Eriogonum bicolor n. sp. Matted cæspitose forming mats one to two feet in diameter from a very thick woody stem whose bark exfoliates like *Artemisia tridentata*, one to three inches high; whole plant tomentose to the glabrous perianth; leaves linear, revolute, six to eight lines long; peduncles scapose, an inch long, bearing a single rather large involucre or occasionally three; bracts minute, green; involucre two lines high, turbinate, not angled, eight-toothed and teeth short and hyaline; pedicel two lines long, erect; flowers five to ten, a line long, base hemi-

spherical and not prolonged, red; lobes orbicular and generally emarginate, white, equal or nearly so. A casual observer would take this to be a form of *E. microthecum*, but it really belongs to the *Pseudo-umbellata*. May 7, 1891, Thompson's Springs, Utah, on adobe plains.

Eriogonum villiflorum var. *candidum* n. var. This is by far the more common form; densely white tomentose throughout even to the flowers, not at all villous; heads very densely short peduncled. July 21, 1891, at Furber, eastern Nevada, at 6000 feet altitude, also at Glencoe, Dugway, etc., western Utah.